

**Journal of Endodontics, 1996, Vol. 22**

**FEBUARY**

**Col. Schindler, Chairman Of Endodontics  
59th MDW Dental Directorate  
Lackland AFB, TX**

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## Evaluation of periapical injection of ketorolac for management of endodontic pain

*Penniston SG, Hargreaves KM. Evaluation of periapical injection of ketorolac for management of endodontic pain. J Endodon 1996;22:55-9.*

**PURPOSE:** To determine if ketorolac tromethamine is effective when injected intraorally at the site of inflammation.

**M&M:** 52 endodontic emergency patients were injected on a double-dummy, placebo controlled basis (both intraorally and intramuscularly) in one of 4 methods: (1) IM placebo and PA placebo; (2) IM 30 mg ketorolac and PA placebo; (3) IM placebo and PA ketorolac; and (4) IM placebo and PA 2% mepivacaine. After the injections, pain scores were recorded at 15, 30, 45, and 60 min, followed by local anes and pulpotomies. The patients' teeth were then temporized and they were asked to record pain scores at 3, 4, 5, and 6 h after initial drug or placebo injection.

**RESULTS:** Intraoral infiltration injection of ketorolac resulted in a significant analgesic effect, with injection into the max PA sites resulting in a greater response and magnitude than injection into max PA sites.

**C&C:** Ketorolac is the first NSAID approved for IM injection. The analgesic effects of infiltrative use of ketorolac intraorally suggest that this may prove to be a useful adjunct in pain control for endodontic pain patients.

**February 1996**

**Michael Hall**

## **Relationship between endodontic preparations and human dentin permeability measured in situ**

*Guignes P, Faure J, Maurette A. Relationship between endodontic preparations and human dentin permeability measured in situ. J Endodon 1996;22:60-7.*

**PURPOSE:** To study the changes in radicular permeability caused by various sequences of endodontic instrumentation with different irrigation solutions.

**M&M:** 30 third molars (having single canals) were horizontally sectioned, and pulpally extirpated. Cylindrically-shaped cavities were made at different zones along the sides of the roots, and these were cleaned free of smear layer by washing with EDTA. Capillary glass tubes were connected to the prepared cavities, and the roots were attached to a fluid filtration measurement system. Three endodontic techniques were applied: (1) conventional filing/irrigation with 2.5% NaOCl; (2) mixed technique using ultrasonic irrigation (2.5% NaOCl); and (3) conventional filing technique with chelation (2.5% NaOCl and 17% EDTA). After permeability measurements were compared, elimination of the smear layer was analyzed by SEM.

**RESULTS:** Alternate use of K-files and Hedstroms led to decreased dentin permeability, whereas techniques using ultrasonic irrigation or EDTA caused an increase. The effect of EDTA at increasing permeability was most pronounced in large diameter canals. Canals enlarged > 4 file sizes showed much greater fluid flow than those enlarged < 4 sizes. Dentinal surfaces treated with EDTA exhibited the least smear layer (which increased slightly from the coronal zone to the apical zone); manual techniques left significant residual smear. An inverse relationship was demonstrated between fluid flow rate across root dentin, and the percentage of the canal surface covered with smear layer; the strongest correlation occurred with the conventional manual instrumentation technique. Dentin thickness was as significant a factor in influencing radicular permeability as was the smear layer.

**C&C:** Endodontic treatment factors which may increase radicular permeability thus include significant reductions in remaining dentin thickness and/or removal of the smear layer (either by use of chelation or, to a lesser degree, by ultrasonics). Greater permeability *may* cause the appearance of secondary periradicular pathosis (clinical correlation as yet undetermined).

**February 1996**

**Christopher F. Bates**

## Hardness and strength of endodontic files and reamers

*Brockhurst PJ, Denholm I. Hardness and strength of endodontic files and reamers. J Endodon 1996;22:68-70.*

**PURPOSE:** To determine the material properties of endo files and reamers using hardness tests, and to assess variations among sizes and brands.

**M&M:** The Vickers hardness of cross-sections of SS root canal files and reamers made by two United States manufacturers and one Japanese manufacturer were examined. #15 and #40 instruments were tested. Seven measurements were made centrally along the fluted portion of each file at 2-mm intervals from the first flute adjacent to the handle.

**RESULTS:** The Vickers hardness values varied considerably, from a highest average hardness value of 651 to a low of 403.

**C&C:** The hardness tests indicate that endo instruments are made from hardened material, but the variation in hardness among the instruments tested suggests that hardness may not be carefully controlled during manufacture. The higher values seemed adequate, but the lower values were below that which is required for Australian steak knives (is dentin harder than Australian beef?). The potential exists for substantial improvement in hardness qualities of endodontic instruments by selecting stronger materials than those currently being used (what stronger materials, for instance?).

**February 1996**

**Michael Hall**

## **Apical leakage after root canal filling with an experimental calcium hydroxide gutta-percha point**

*Holland R, Murata SS, Dezan E, Garlipp O. Apical leakage after root canal filling with an experimental calcium hydroxide gutta-percha point. J Endodon 1996;22:71-3.*

**PURPOSE:** To observe if the use of gutta-percha (GP) points containing calcium hydroxide (CH) reduces apical leakage.

**M&M:** 110 single-rooted teeth were extracted, decoronized, and endodontically prepared to size #40 at working length. 30 roots were dressed with CH, sealed, and stored for 7 d. Following CH dressing removal, these roots and the remaining 80 were divided into 11 groups of 10 roots each - 2 control groups; and 9 experimental groups, which were obturated with regular or CH-GP points, and either Endomethasone, Grossman, or ZOE sealers. Leakage was determined after 24 h, by measuring methylene blue-vacuum dye penetration.

**RESULTS:** The groups of canals dressed with CH and those obturated with CH-GP points exhibited significantly less leakage than the groups filled with regular GP points.

**C&C:** Whether by previous dressing, or incorporation into the GP, calcium hydroxide appears to positively affect apical leakage, at least in the short term. It is possible that the CH produces a volumetric expansion of the sealer, or that CH is mechanically blocking the dentinal tubules.

**February 1996**

**Christopher F. Bates**

## Interpretation of chemically created lesions using direct digital imaging

*Tirrell BC, Miles DA, Brown, Jr CE, Legan JJ. Interpretation of chemically created lesions using direct digital imaging. J Endodon 1996;22:74-8.*

**PURPOSE:** To determine if RVG could demonstrate artificial jaw lesions in cortical bone earlier than conventional radiography.

**M&M:** Six human cadaver jaws were used, 3 max and 3 man. The specimens were mounted on Plexiglas bases. Periapical lesions were created on the buccal cortical plates with 70% perchloric acid and radiographed with conventional E-speed film (n=42). RVG was used to obtain 294 direct digital images. Designated exposure times were 12, 24, 36, 48, 72, and 96 h after acid exposure, each time increment representing a more advanced lesion. Radiographs and RVG images were then evaluated, the evaluators instructed to disregard presence or absence of lamina dura and focus solely on presence or absence of a periapical radiolucency.

**RESULTS:** At 12 and 24 h after acid exposure, RVG demonstrated significantly more lesions than conventional radiography. There were no sig differences between the two after 36, 48, 72, and 96 h. No particular RVG setting could be determined to be more diagnostic than another.

**C&C:** The technique of using acid to create jaw lesions rather than using burs was to try to more accurately simulate the clinical situation in which a well-defined radiographic border may not be present. The results of the study found that RVG was more effective in detecting lesions earlier than conventional xrays, ie when they were smaller. Once the lesions had become sufficiently large to detect by conventional radiography, there was no difference between RVG and E-speed films. The E-speed films were exposed using 90 kVp and 10 mA; lower density settings may have shown greater density changes earlier. Also, the E-speed films were not viewed with magnification, which also may have made a difference.

February 1996

Michael Hall

## Antibacterial activities of root canal sealers against selected anaerobic bacteria

*Siqueira JF, Gonçalves RB. Antibacterial activities of root canal sealers against selected anaerobic bacteria. J Endodon 1996;22:79-80.*

**PURPOSE:** To compare the antibacterial activity of three endodontic sealers containing calcium hydroxide with that of a zinc oxide-eugenol sealer, against selected anaerobic bacteria commonly found in endodontic infections.

**M&M:** Agar plates were inoculated with the following bacteria: *Porphyromonas endodontalis*, *Porphyromonas gingivalis*, *Actinomyces israelii*, *Propionibacterium acnes*, *Fusobacterium nucleatum*, *Wolinella recta*, *Staphylococcus aureus* and *Actinomyces naeslundii*. Wells were punched in the agar plates, and these were filled with one of the following materials: Fill Canal (Grossman's ZOE formulation), Sealapex (Ca(OH)<sub>2</sub>), Sealer 26 (same chemical content as AH26, except has Ca(OH)<sub>2</sub> and lacks silver), Apexit (also Ca(OH)<sub>2</sub>), and Ca(OH)<sub>2</sub> mixed with sterile saline (control). Following 7 d incubation, diameters of zones of bacterial inhibition were measured.

**RESULTS:** Fill Canal demonstrated large zones of inhibition against all bacteria tested. Sealer 26 was inhibitory to most of the strains, but was not effective against *P. endodontalis* and *P. gingivalis*. There was no great difference between Ca(OH)<sub>2</sub> and Sealapex activities, each having low activity. Apexit was ineffective against all species tested.

**C&C:** The strong antibacterial activity of Fill Canal was probably due to its eugenol content. That of Sealer 26 may have been due to formaldehyde release prior to hardening, or to its Ca(OH)<sub>2</sub> content. The generally weak antibacterial performance by Ca(OH)<sub>2</sub> preparations in this study was not consistent with previous work by Sjogren et al. (1991); however, the low solubility of Ca(OH)<sub>2</sub> could slow its diffusion through agar.

February 1996

Christopher F. Bates

## **Pressure waves in root canals induced by Nd:YAG laser**

*Levy G, Rizoiu I, Friedman S, Lam H. Pressure waves in root canals induced by Nd:YAG laser. J Endodon 1996;22:81-4.*

**PURPOSE:** To detect pressure waves in water-filled root canals irradiated with Nd:YAG laser, and to compare them to pressure waves generated sonically and ultrasonically.

**M&M:** 14 extracted single-rooted teeth were used. The root canals were prepared endodontically. A 2-mm segment of each tooth was resected apically, and the tooth was attached to a piezoelectric transducer, which was connected to an oscilloscope. The canal was filled with water, and the set-up was submerged in a water bath. In 12 teeth, a pulsed Nd:YAG laser was activated in the canal at various optical fiber diameter/power setting combinations. In one tooth, a #15 sonic file was vibrated (MM 1500), and in the other, a #15 ultrasonic file was vibrated (Enac). The transducer detected pressure waves generated in the canals, signals proportional to the wave intensity were displayed on the oscilloscope, and the wave amplitudes were measured.

**RESULTS:** The Nd:YAG laser-produced signals were sinusoidal in configuration, decreasing in amplitude with time and having a frequency of 0.46 KHz. There was a high positive correlation between the signal amplitude and laser power density. The sonic waves were also sinusoidal, but with constant amplitude and a frequency of 0.5 KHz. The signals from the ultrasonic vibration had uniform amplitudes characterized by sharp peaks and a frequency of 14.7 KHz.

**C&C:** The results of this study showed that Nd:YAG laser radiation generated in root canals produces cavitation, resulting in pressure waves in the water-filled canals. The power density of the beam is inversely proportional to the diameter of the focal spot of the beam, and correlates with the intensity of the induced pressure waves. Thus...the authors speculate that the cavitation-induced pressure waves created in either narrow or enlarged canals by the Nd:YAG laser with concurrent irrigation may result in cleaner canal walls.

**February 1996**

**Michael Hall**



## **An anti-zipping preparation system (method and instrument) for curved root canals: a preliminary report**

*Marroquin BB. An anti-zipping preparation system (method and instrument) for curved root canals: a preliminary report. J Endodon 1996;22:85-9.*

**PURPOSE:** To propose a new enlarging system for curved root canals.

**M&M:** Features of the prototype instrument (made by Maillefer) include (1) a segment of cutting flutes which cover only 180°, instead of the usual 360°; (2) the number of cutting flutes varies between 7-10 (over a 4-5 mm length); (3) the noncutting shaft is narrower than the cutting segment; and (4) the diameter, length and taper follow ISO specifications. The technique is divided into four phases: (1) Debridement and preparation of the straight portion of the canal, using Peesos; (2) removal of debris at the end of the prepared segment with conventional instruments; (3) preparation of the concave and convex sides of the canal are performed individually using the prototype size #15 instrument. First, the cutting segment is faced toward the concave part of the canal, and gentle 60-65° clockwise-counterclockwise rotations are made while advancing slowly toward the apex. Repeat procedures for the convex surface (don't forget to turn instrument over) 2-3 sizes larger; and (4) taper the canal by alternating sides with the next sized instrument.

**DISCUSSION:** The author demonstrated prepared canals of plastic blocks, which appeared symmetrically prepared at the apical one-third. He claims the reduced cutting area allows more effective tactile control, and that its aggressive design (Hedstrom-style flutes) shapes faster in preestablished canal sectors. One problem admitted was poor coronal transportation of debris.

**C&C:** As with other unidirectional file designs, this one requires orientation toward the inner or outer portion of the curve for low-risk, optimal performance. This seems impractical, since radiographs limit our interpretation of curvature to the two dimensions of the film.

**February 1996**

**Christopher F. Bates**

## **Long-term evaluation of retrograde root filling with dentin-bonded resin composite**

*Rud J, Rud V, Munksgaard EC. Long-term evaluation of retrograde root filling with dentin-bonded resin composite. J Endodon 1996;22:90-3.*

**PURPOSE:** To determine the status of in vivo composite resin root-end fillings placed 8 and 9yrs ago.

**M&M:** 33 of 34 root-end fillings placed with the dentin bonding agent Gluma and Retroplast composite resin, previously reported by the authors, were reexamined: 6 fillings after 8 yr in place, and 27 after 9 yr in place. Healing was estimated by radiography and all cases were examined clinically.

**RESULTS:** Radiographic evaluation revealed that 32/33 Retroplast fillings showed complete bone healing. 9/32 showed a PDL space of normal width and the presence of lamina dura. No signs or symptoms were found clinically during the examination of the 32 successful cases.

**C&C:** This study apparently indicates that the Gluma bonding of Retroplast and root dentin remains stable over an extended period (8-9 yrs) of time, maintaining a clinically-acceptable apical seal. Since the authors have used this magic material in ~ 3000 surgeries since 1984, and the success rate for the 34 published cases is 97%, does that mean they got that success rate with all the others? And if so, why aren't we using it?

**February 1996**

**Michael Hall**

## **Use of a bioresorbable guided tissue membrane as an adjunct to bony regeneration in cases requiring endodontic surgical intervention**

*Uchin RA. Use of a bioresorbable guided tissue membrane as an adjunct to bony regeneration in cases requiring endodontic surgical intervention. J Endodon 1996;22:94-6.*

**REVIEW:** There are times when the predictability of a surgical endodontic procedure would be enhanced by the utilization of a guided tissue regeneration membrane with or without an accompanying bone grafting procedure. Guidor is a bioresorbable matrix barrier (composed of polylactic acid), which slowly resorbs through hydrolysis and is gradually replaced by periodontal tissue.

**CASES:** (1) A 50-yr-old female with previous RCT and apicoectomy of tooth #2, as well as DF root amputation and RCT on tooth #3 presented on a regimen of Amoxicillin. Upon exam, the patient had 10+ mm trifacial point probings on #2. Flap reflection revealed facial dehiscence extending apically, and a MF radicular periapical lesion on #2. After root-end resections and curettage, a Guidor membrane (molar, straight, large) was placed. (2) A 65-yr-old patient with previous RCT on tooth #31 presented with a dull clinical awareness from the area, an 8-10 mm F probing depth, and a periapical radiolucency. After F flap reflection, a dehiscence to the apex was discovered. A Guidor membrane was placed. At 6 mo, the probing had decreased to 4-5 mm, but the radiographic findings were unchanged. Both patients were maintained on Peridex rinses for 6 mo. Pocket recording and mobility documentation of these cases were not recorded.

**February 1996**

**Christopher F. Bates**